

CLAIMS

Sub B

1. An enzyme-containing granule comprising a core unit and a shell unit, wherein the core unit comprises the enzyme and is enclosed in a shell unit which is substantially enzyme-free, the ratio between the diameter of the granule and the diameter of the core unit being at least 1.1.

2. An enzyme-containing granule of claim 1, wherein the ratio between the diameter of the granule and the diameter of the core unit is at least about 2.5. ✓

a 3. An enzyme-containing granule of claim 1 or 2, wherein the size of the enzyme core unit, in terms of its diameter in its longest dimension, is no more than 1000 μm , preferably no more than 700 μm or 600 μm , preferably between 100 and 500 μm , such as between 100 and 400 μm , preferably between 200 and 300 μm .

Sub B2 a

4. An enzyme-containing granule of any of the preceding claims, wherein the size of the core unit, in terms of its relative mass compared to the overall mass of the granule, is up to about 30%, such as up to about 20%, such as up to about 15%, preferably up to about 10%, such as up to about 5%.

a 5. An enzyme-containing granule of any of the preceding claims, wherein the enzyme content in the core unit, calculated as pure enzyme protein, is in the range of from about 20% to 100% by weight of the enzyme core unit, preferably no less than 25%, such as no less than 30%, 35%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%, 90%, or 95% by weight.

a 6. An enzyme-containing granule of any of the preceding claims, wherein the enzyme is homogeneously dispersed within the enzyme core unit. ✓

- claim 1*
- a 7. An enzyme-containing granule of any of claims 1-5, wherein the granule is a co-granule comprising more than one type of enzyme.
- 5.
- a 8. An enzyme-containing granule of claim 1-5, wherein the granule comprises a structured core unit such as a multi-layered core unit or a clustered-particle core unit.
- claim 1*
- a 10. An enzyme-containing granule of any of the preceding claims, further comprising a film layer around the core unit to protect the core unit from components present in the shell unit.
- claim 1*
15. A granulated enzymatic product comprising a multiplicity of enzyme granules of any of claims 1-9, wherein the enzyme core units have a particle size distribution such that the ratio $(D_{90} - D_{10})/D_{50}$ is not more than about 2.5, preferably not more than about 2.0, more preferably not more than about 1.5, most preferably not more than about 1.0.
- B3*
- 20
11. A process for preparing an enzyme-containing granule having a core-shell configuration, comprising the steps of providing an enzyme-containing core unit, and coating the core unit with a shell which is substantially enzyme-free, so that the ratio between the diameter of the granule and the diameter of the core unit is at least 1.1.
- 25
12. The process of claim 11, wherein the ratio between the diameter of the granule and the diameter of the core unit is at least 2.5.
- 30
13. The process of claim 11 or 12, wherein the size of the enzyme core unit, in terms of its diameter in its longest dimension, is no more than 1000 μm , preferably no more than 700

μm or 600 μm , preferably between 100 and 500 μm , such as between 100 and 400 μm , preferably between 200 and 300 μm .

14. The process of any of claims 11-13, wherein the size of the core unit, in terms of its relative mass compared to the overall mass of the granule, is up to about 30%, such as up to about 20%, such as up to about 15%, preferably up to about 10%, such as up to about 5%.

10 15. The process of any of claims 11-14, wherein the enzyme content in the core unit, calculated as pure enzyme protein, is in the range of from about 20% to 100% by weight of the enzyme core unit, preferably no less than 25%, such as no less than 30%, 35%, 40%, 45%, 50%, 55%, 60%, 65%, 70%, 75%, 80%, 85%,
15 90%, or 95% by weight.

16. The process of any of claims 11-15, wherein the enzyme is homogeneously dispersed within the enzyme core unit.

20 17. The process of any of claims 11-15, wherein the granule is a co-granule comprising more than one type of enzyme.

18. The process of claim 17, wherein the granule comprises a structured core unit such as a multi-layered core unit or a
25 clustered-particle core unit.

19. The process of any of claims 11-18, further comprising, prior to application of the shell unit, forming a film layer around the core unit to protect the core unit from components
30 present in the shell unit.

20. The process of any of claims 11-19, comprising forming a multiplicity of enzyme granules wherein the enzyme core units have a particle size distribution such that the ratio (D90 -

D₁₀)/D₅₀ is not more than about 2.5, preferably not more than about 2.0, more preferably not more than about 1.5, most preferably not more than about 1.0.

- 5 21. The process of any of claims 11-20, wherein the enzyme core is formed using a spray cooling process, a spray drying process, a melt granulation process, an emulsion granulation process and/or a high shear granulation process.
- 10 22. The process of any of claims 11-21, wherein the shell unit is formed using a mechanical coating step optionally combined with a fluid bed drying step.
- 15 23. The process of any of claims 11-21, wherein the shell unit is formed using a fluid bed coating process.
- 20 24. The process of any of claims 11-23, wherein the core unit is produced in a first step and then stored and/or shipped prior to subsequent formation of the shell unit in a second step, the enzyme core unit optionally being coated with a film layer prior to storage and/or shipping.
- 25 25. The process of claim 24, wherein the time span between the first step of producing the core unit and the second step of formation of the shell unit is 1 to 24 hours, preferably 1 to 7 days.
- 30 26. A composition comprising enzyme-containing granules of any of claims 1-10.
27. The composition of claim 26, wherein the composition is a feed additive.
- 35 28. The composition of claim 26, wherein the composition is a detergent additive.

29. The composition of claim 26, wherein the composition is a feed.

5 30. The composition of claim 26, wherein the composition is a detergent.

31. Use of the enzyme-containing granule of any of claims 1-10
for improving a bread.

10 32. Use of the enzyme-containing granule of any of claims 1-10
for improving a feed.

33. Use of the detergent composition of claim 30 for cleaning
15 an object.

34. An emulsion granulation process for preparing an enzyme containing particle comprising

- (a) dispersing or dissolving an enzyme in a molten wax,
- 20 (b) transferring the dispersion to a liquid phase, in which both the enzyme and the wax are immiscible,
- (c) forming an emulsion of small droplets of the enzyme-wax dispersion in the liquid phase,
- (d) cooling the liquid phase and the enzyme-wax droplets to
25 solidify the wax into particles,
- (e) isolating the particles from the liquid phase.

35. A process for preparing an enzyme containing particle comprising atomizing an enzyme containing liquid starting material
30 by means of a Rayleigh atomizing device.

36. The process of claim 35, wherein the liquid is an aqueous liquid and the process is a spray drying process.

- ~~37. A dough improver composition comprising the particles obtained by the process of claim 36.~~

~~38. A flour composition comprising the dough improver of claim~~

add B4